W 75/984

Preprint from the 1984

BUREAU OF MINES MINERALS YEARBOOK

The Mineral Industry of Wisconsin

NEWARK PUBLIC LIBRARY

APR 23 1986

U. S. GOVT. PUBS.
DEPOSITORY 376

UNITED STATES DEPARTMENT OF THE INTERIOR

I28.37/a2:

READEX MICRO best copy available

UNITED STATES DEPARTMENT OF THE INTERIOR • Donald Paul Hodel, Secretary

BUREAU OF MINES • Robert C. Horton, Director

This publication is a chapter from the current Bureau of Mines Minerals Yearbook, comprising *Volume I, Metals and Minerals; Volume II, Area Reports: Domestic; Volume III, Area Reports: International.* The separate volumes of the Yearbook are sold by the Superintendent of Documents, Washington, D.C. 20402.

The Mineral Industry of Wisconsin

This chapter has been prepared under a Memorandum of Understanding between the Bureau of Mines, U.S. Department of the Interior, and the Wisconsin Geological and Natural History Survey for collecting information on all nonfuel minerals.

By James J. Hill,[1] Thomas J. Evans,[2] and Wanda J. West[3]

Wisconsin's nonfuel mineral production was valued at $129.3 million in 1984. Nationally, the State ranked 36th in value of mineral output. After dropping to an 11-year low in 1983, mineral production value increased modestly because of gains in housing and other building activity that expanded demand for mineral commodities used in construction. Sales of crushed stone and construction sand and gravel accounted for 64% of the State's mineral value. Portland cement had the greatest increase in sales value, followed by industrial sand, masonry cement, construction sand and gravel, peat, and abrasive stone. Mineral commodities processed in Wisconsin from out-of-State sources included iron oxide pigments, perlite, and vermiculite. Sulfur was recovered as a refinery byproduct. No metallic minerals were produced in the State.

Table 1.—Nonfuel mineral production in Wisconsin[1]

Mineral		1983		1984	
		Quantity	Value (thousands)	Quantity	Value (thousands)
Lime	thousand short tons	319	$17,624	373	$19,892
Peat	do.	9	W	9	W
Sand and gravel:					
Construction	do.	*14,200	*28,800	17,785	38,245
Industrial	do.	621	7,208	1,060	11,821
Stone:					
Crushed	do.	14,252	39,896	*15,800	*45,000
Dimension	do.	24	2,884	*24	*2,863
Combined value of abrasive stone, cement, and values indicated by symbol W		XX	4,779	XX	11,527
Total		XX	101,191	XX	129,348

*Estimated. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Table 2.—Value of nonfuel mineral production in Wisconsin, by county[1]

(Thousands)

County	1982	1983	Minerals produced in 1983 in order of value
Adams	$43	(2)	
Ashland	55	(2)	
Barron	251	(2)	
Bayfield	1	(2)	
Brown	W	W	Lime, stone (crushed).
Buffalo	16	$339	Stone (crushed).
Burnett	207	(2)	
Calumet	W	W	Stone (crushed), stone (dimension).
Chippewa	103	(2)	
Clark	364	W	Stone (crushed).
Columbia	W	W	Sand (industrial), stone (crushed).
Crawford	W	W	Stone (crushed).
Dane	944	1,928	Do.
Dodge	W	W	Stone (crushed), lime.
Door	559	W	Stone (crushed).
Douglas	W	W	Lime, stone (crushed).
Dunn	W	185	Stone (crushed).
Eau Claire	W	(2)	
Fond du Lac	W	1,841	Stone (crushed), lime, stone (dimension).
Forest	109	(2)	
Grant	(3)	1,108	Stone (crushed).
Green	(3)	W	Do.
Green Lake	W	W	Sand (industrial), stone (crushed).
Iowa	(3)	1,211	Stone (crushed).
Iron	W	(2)	
Jackson	W	W	Sand (industrial).
Jefferson	102	365	Stone (crushed).
Juneau	25	W	Do.
Kenosha	1,474	(2)	
Kewaunee	234	(2)	
La Crosse	34	W	Stone (crushed).
Lafayette	(3)	791	Do.
Langlade	W	(2)	
Lincoln	229	(2)	
Manitowoc	W	W	Lime, stone (crushed).
Marathon	659	4,681	Stone (crushed), stone (dimension).
Marinette	62	W	Sand (industrial), stone (crushed), stone (dimension).
Marquette	140	(2)	
Milwaukee	W	W	Cement, stone (crushed).
Monroe	(3)	1,441	Stone (crushed).
Oconto	348	W	Do.
Oneida	448	(2)	
Outagamie	(3)	1,469	Stone (crushed).
Ozaukee	364	W	Do.
Pepin	40	19	Do.
Pierce	W	954	Stone (crushed), sand (industrial).
Polk	135	W	Stone (crushed).
Portage	1,405	(2)	
Price	42	(2)	
Racine	871	W	Stone (crushed).
Richland	12	135	Do.
Rock	1,423	1,221	Do.
Rusk	388	(2)	
St. Croix	370	W	Stone (crushed).
Sauk	W	W	Stone (crushed), abrasive stone.
Sawyer	W	(2)	
Shawano	567	W	Stone (crushed).
Sheboygan	601	W	Do.
Taylor	684	(2)	
Trempealeau	(3)	W	Stone (crushed).
Vernon	(3)	W	Do.
Vilas	138	(2)	
Walworth	872	W	Stone (crushed).
Washburn	W	(2)	
Washington	1,487	W	Stone (crushed).
Waukesha	W	W	Stone (crushed), peat, stone (dimension).
Waupaca	609	87	Stone (crushed).
Waushara	W	(2)	
Winnebago	W	1,170	Stone (crushed).
Wood	(3)	W	Do.
Undistributed[4]	56,550	53,446	
Sand and gravel (construction)	XX	e28,800	

See footnotes at end of table.

Table 2.—Value of nonfuel mineral production in Wisconsin, by county[1] —Continued

(Thousands)

County	1982	1983	Minerals produced in 1983 in order of value
Stone:			
Crushed	e$36,100	XX	
Dimension	r e2,815	XX	
Total	r111,880	$101,191	

eEstimated. rRevised. W Withheld to avoid disclosing company proprietary data; included with "Undistributed." XX Not applicable.

[1]Florence and Menominee Counties are not listed because no nonfuel mineral production was reported.

[2]Construction sand and gravel was produced; data not available by county. Total State value is shown separately under "Sand and gravel (construction)."

[3]Stone, either crushed or dimension, was produced; data not available by county. Total State values are shown separately under "Stone."

[4]Includes construction sand and gravel that cannot be assigned to specific counties (1982) and values indicated by symbol W.

Table 3.—Indicators of Wisconsin business activity

		1982r	1983	1984p
Employment and labor force, annual average:				
Population	thousands	4,745	4,746	4,766
Total civilian labor force	do.	2,440	2,426	2,394
Unemployment	do.	260	253	176
Employment (nonagricultural):				
Mining total[1]	do.	1.9	1.9	1.8
Metal mining[2]	do.	.2	.1	NA
Nonmetallic minerals[2]	do.	1.6	1.8	1.8
Manufacturing total	do.	498.2	484.1	517.8
Primary metal industries	do.	20.1	17.6	19.9
Stone, clay, and glass products	do.	7.9	7.8	7.4
Chemicals and allied products	do.	9.3	9.3	9.9
Petroleum and coal products[2]	do.	.4	.4	NA
Construction	do.	56.9	57.7	58.3
Transportation and public utilities	do.	89.4	88.1	89.7
Wholesale and retail trade	do.	428.9	433.3	453.8
Finance, insurance, real estate	do.	95.8	98.6	102.2
Services	do.	381.4	388.6	403.9
Government and government enterprises	do.	314.1	312.5	313.6
Total[3]	do.	1,866.7	1,864.6	1,941.1
Personal income:				
Total	millions	$51,143	$53,654	$59,453
Per capita		$10,778	$11,305	$12,474
Hours and earnings:				
Total average weekly hours, production workers		39.6	40.7	41.4
Total average hourly earnings, production workers		$9.37	$9.78	$10.03
Earnings by industry:				
Farm income	millions	$1,442	$1,343	$2,247
Nonfarm	do.	$34,178	$35,972	$39,551
Mining total	do.	$47	$46	$48
Metal mining	do.	$6	$3	$2
Nonmetallic minerals	do.	$35	$41	$42
Manufacturing total	do.	$11,816	$12,197	$13,704
Primary metal industries	do.	$496	$472	$575
Stone, clay, and glass products	do.	$177	$183	$202
Chemicals and allied products	do.	$259	$277	$304
Petroleum and coal products	do.	$14	$16	$17
Construction	do.	$1,473	$1,570	$1,792
Transportation and public utilities	do.	$2,332	$2,431	$2,622
Wholesale and retail trade	do.	$5,414	$5,675	$6,149
Finance, insurance, real estate	do.	$1,766	$1,980	$2,154
Services	do.	$6,020	$6,462	$7,092
Government and government enterprises	do.	$5,184	$5,477	$5,839
Construction activity:				
Number of private and public residential units authorized		12,312	16,962	16,719
Value of nonresidential construction	millions	$633.8	$730.9	$783.8
Value of State road contract awards	do.	$173.3	$293.2	$235.9
Shipments of portland and masonry cement to and within the State	thousand short tons	1,080	1,283	e1,458

See footnotes at end of table.

Table 3.—Indicators of Wisconsin business activity —Continued

		1982[r]	1983	1984[p]
Nonfuel mineral production value:				
Total crude mineral value	millions	$111.9	$101.2	$129.3
Value per capita		$24	$21	$27

[p]Preliminary. [r]Revised. NA Not available.
[1]Bureau of Labor Statistics, U.S. Department of Labor; totals may not add because of inclusion of data from other sources.
[2]Bureau of Economic Analysis, Regional Economic Measurement Division, U.S. Department of Commerce.
[3]Data may not add to total shown because of independent rounding.

Sources: U.S. Department of Commerce, U.S. Department of Labor, Highway and Heavy Construction Magazine, and U.S. Bureau of Mines.

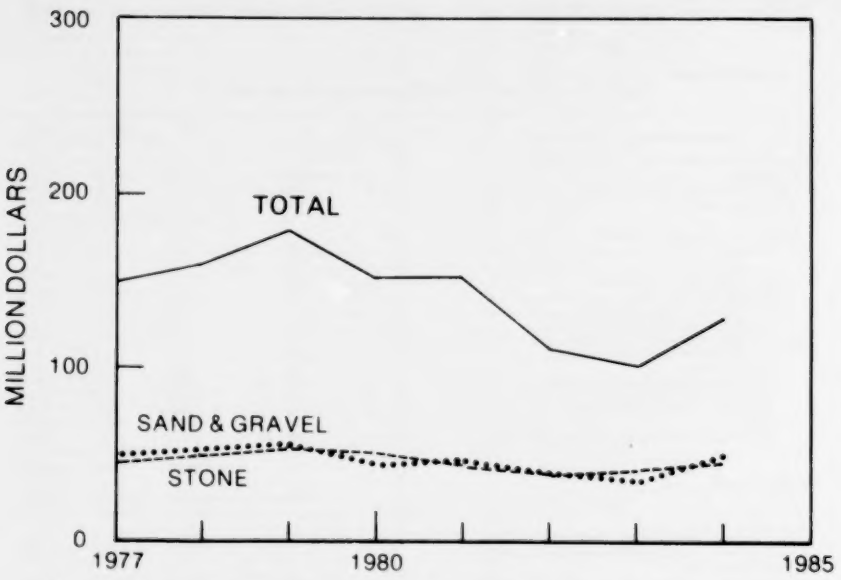

Figure 1.—Value of sand and gravel and stone and total value of nonfuel mineral production in Wisconsin.

Trends and Developments.—Environmental assessment of Exxon Minerals Co.'s Crandon Project continued in 1984. The discovery of the 67.4-million-metric-ton zinc-copper ore body was announced in May 1976. The proposed mine-mill complex has been the object of numerous environmental baseline, engineering design, and operational modeling investigations that have continued since Exxon submitted its initial permit applications and environmental report in late 1982. Primary areas of public concern in 1984 were the assessment of the socioeconomic impacts of the proposed mine-mill complex, design of the mine-waste disposal facility, and modeling of ground water effects of mine dewatering. At yearend, the draft Environmental Impact Statement for the project was expected to be released in mid-1985, with decisions on relevant permits expected in late 1986.

Intensive full-scale reclamation was under way at the Jackson County Iron Co. taconite minesite that closed in October 1983. Efforts focused on reseeding the mine dumps and tailings basin. A perimeter fence was installed to restrict access to the 130-acre pit that has been steadily filling with

Figure 2.—Principal mineral producing localities in Wisconsin.

water. When filled, the pit will become one of the deepest lakes in Wisconsin. Local authorities have been actively involved in trying to attract new users for the mine-mill site, which has power and rail and highway access.

Employment.—Wisconsin's economy continued to expand in 1984. The State Department of Industry, Labor, and Human Relations (DILHR) reported the State's average monthly unemployment rate (unadjusted) dropped from 10.4% in 1983 to 7.7% in 1984, a 26% change. Each percentage point in the State's unemployment rate in 1984 represented 24,000 persons. Employment in the mining sector decreased 5% from about 1,900 workers in 1983 to 1,800 in 1984. Average annual earnings increased from $22,204 in 1983 to $22,520 in 1984. Employment in the State's iron and steel foundries increased 15.6%, from 9,600 workers in 1983 to 11,100 in 1984.

DILHR reported no strikes in 1984 within the industrial classifications of mining nonmetallic minerals; stone, clay, glass, and concrete products; or the fabricated metal industries. However, in the primary metal industries, Anaconda American Brass Co. at Kenosha was on strike from April 9 to April 30 with 665 workers involved.

The number of building plans examined for compliance with the State's commercial building code in 1984 increased 24% compared with that of 1983. This building activity had a positive effect on employment and created increased demand for mineral commodities used in construction.

During 1984, the Wisconsin Department of Transportation awarded or approved highway construction contracts and agreements totaling $235.6 million,[4] approximately 1.7% more than the all-time record high of $231.7 million committed in 1983. This increased activity also stimulated demand for mineral commodities used in construction and provided job opportunities.

The Wisconsin Department of Development reported that new industry and plant expansions in the State's manufacturing sector increased for the second consecutive year, from 282 projects in 1983 to 320 projects in 1984. The capital investment projects were expected to provide 5,701 new manufacturing jobs, 16% higher than in 1983. Total capital investment was $386.2 million.

Exploration Activities.—Metallic mineral exploration drilling occurred in 10 counties during 1984. Of the 18 companies licensed to explore in the State, 8 actually drilled holes. In 1984, 54 holes were drilled compared with 74 in 1983. Thirty-one of the drill holes were completed in Lafayette and Pierce Counties, outside of the Proterozoic metavolcanic terrane in northern Wisconsin—the geologic environment in which most base metal exploration has occurred during the past 10 years. The Pierce County drilling featured a series of closely spaced shallow holes for an unspecified metallic mineral. Occurrences of gold and diamonds have been reported in the general area in the past but have not been substantiated.

In Lafayette County and adjoining Grant County, part of the Upper Mississippi Valley zinc-lead district, drilling was for zinc and lead. Mining ended in the district in 1979 because it was no longer profitable, although substantial reserves are known to exist. Other metallic mineral exploration was spread across north-central Wisconsin in Chippewa, Iron, Lincoln, Marathon, Price, Rusk, and Taylor Counties. Drilling activity during 1984 is summarized in table 4.

Table 4.—Wisconsin: Metallic mineral exploration in 1984

Licensed exploration companies	Number of drill holes	Total footage drilled
AMAX Exploration Inc	2	890
American Copper & Nickel Co. Inc	4	1,391
Inspiration Development Co	2	1,136
Kerr-McGee Corp	6	3,695
Ernest K. Lehmann & Associates of Wisconsin Inc	5	3,438
Mobil Mineral Resources Inc	15	3,130
Superior Mining Co	19	1,612
United States Borax & Chemical Corp	1	1,372
Total	54	16,664

Source: Wisconsin Geological and Natural History Survey. Metallic Mineral Exploration in Wisconsin, Summary of 1984 Activity.

Numerous articles about diamond exploration activities in several northeastern Wisconsin counties appeared in the local press during 1984. A mineralogy buff reportedly found several small diamonds in glacial debris near Antigo in Langlade County. Prospecting was also reported in Florence and Forest Counties. Across the border in Michigan, Dow Chemical Co. was prospecting a kimberlite deposit that it had leased from the State. Several other companies were also known to be prospecting in the region.

Leasing activity for metallic minerals was down more than 80% during the year, totaling slightly more than 2,700 new acres leased.[8] This was the lowest annual total since records of metallic mineral leasing activity became available in 1978. The parcels leased included acreage in six counties.

In contrast with metallic minerals, leasing of private and public lands for oil and gas exploration greatly accelerated in 1984. Seven exploration companies or land acquisition firms acquired nearly 200,000 acres of land through leases, bringing the total oil and gas acreage leased to over 225,000 acres. At yearend, many acres of public lands, principally county forests and parcels within the Chequamegon National Forest, were under active negotiation for lease. Lease applications were estimated to cover more than 1 million acres. The principal companies involved in oil and gas leasing included Amoco Production Co., Benchmark Resources Corp., Texaco Inc., and Chevron U.S.A. Inc.

Shipping.—Waterborne commerce passing through the Port of Duluth-Superior totaled 32.5 million metric tons in 1984, about 13% more than the 28.8 million tons reported in 1983.[9] Iron ore and concentrates shipped to domestic ports totaled 17.4 million tons in 1984, about 22% more than the 14.3 million tons shipped in 1983. Shipments to Canadian ports totaled 1.8 million tons compared with 1.5 million tons in 1983. The American Iron Ore Association reported 11.3 million tons of iron ore and concentrates shipped through the Burlington Northern Inc. facility on Allouez Bay in Superior in 1984. This was about 29% more than was shipped in 1983. Burlington Northern loaded its first cargo on April 4 and its final cargo on December 22.

Limestone and limestone products delivered to the port from Canadian and domestic sources totaled 994,671 metric tons in 1984 compared with 963,674 tons delivered in 1983. Some of these products were delivered to the CLM Corp. lime plant and the Huron Cement Div. of National Gypsum Co. clinker-grinding facility in Superior. Other products went to a cement distributor in Duluth, and some limestone was trucked to sugar refineries in western Minnesota.

The Midwest Energy Terminal in Superior shipped a record high 6.7 million short tons of low-sulfur Montana coal to Michigan power generating plants in 1984. In 1983, 5.7 million tons was shipped.

Approximately 2.5 million tons of cargo passed through the Port of Green Bay in 1984, compared with 2.3 million tons in 1983. This commerce resulted in an economic impact of over $35 million on the surrounding area. The major mineral commodities entering the port, in order of tonnage, were coal, limestone, cement, and salt.

The Port of Milwaukee reported a 21% increase in waterborne cargo shipped through the port. A large amount of crushed limestone was imported for a new dockwall extension under construction by the Milwaukee Metropolitan Sewerage District. Receipts of sand for the area's foundries showed the greatest increase in tonnage, and receipts of pig iron for area foundries also showed a sizable increase. Cement was imported for area distribution terminals. Clinker and gypsum were imported for use at a local cement grinding facility. Salt was imported for use in snow and ice removal.

Table 5.—Port of Milwaukee: Selected nonfuel mineral commodity imports[1]

(Short tons)

Commodity	1983	1984
Cement	330,037	388,796
Clinker	92,000	81,219
Concrete aggregate	--	11,067
Gypsum	4,400	6,110
Limestone	--	129,295
Pig iron	r51,580	67,445
Potash	11,821	--
Salt	388,058	524,393
Sand	10,782	44,985
Total	r888,678	1,253,310

rRevised.
[1]Includes Canadian imports and domestic receipts.

Source: 1984 Annual Report, Port of Milwaukee, U.S.A.

The Lake Carriers Association reported no U.S. flag carriers or tankers were built for Great Lakes service in 1984 nor were any under construction.

Legislation and Government Programs.—In 1984, the Wisconsin Legislature passed four laws affecting the mineral industry. Act 176 authorized nonmetallic mining reclamation ordinances and gave pre-

eminence to county government ordinances over town ordinances with respect to nonmetallic mining. The passage of this legislation culminated an effort of more than 5 years to develop statutory authority on upland mining operations within the State. Act 335 provided an exemption for metallic minerals mining leases and oil and gas exploration leases from the State's limitation of land ownership by nonresident aliens. The restriction of alien ownership to 640 acres posed a significant concern to foreign-owned corporations involved in mineral exploration and potential mineral development. Act 455 required the registration of severed mineral interests in the State. Based on the dormant-minerals approach, the new law provided a 3-year period (July 1, 1984, to July 1, 1987) for owners of severed mineral interests to use their minerals. "Use of minerals" was broadly defined and included registering a statement of mineral claim, leasing the minerals, extracting a mineral resource, or paying a tax on the mineral interest. Act 517 modified the statutes relating to determining when abandonment of metallic mining occurs. Determination of abandonment triggers mandatory reclamation activities, and the new law provided a somewhat more lenient time frame for the Department of Natural Resources (DNR) decisionmaking in this regard.

A bill that would give the DNR explicit authority to regulate oil and gas exploratory drilling, SB 638, was introduced in 1984 but failed to move forward rapidly enough to receive any floor action. The DNR, citing its general authority to protect the waters of the State, proceeded with drafting administrative rules for oil and gas exploration. Hearings on the proposed Natural Resources rules, NR134, were scheduled at yearend.

The Mining Investment and Local Impact Fund Board disbursed more than $500,000, principally to local governments in the vicinity of Exxon's proposed Crandon Project. Disbursements in 1984 included $416,400 in permit-period payments to four local governments, as mandated by State law; $27,847 to governmental units near Jackson County Iron's now-closed Black River Falls taconite mine; and $58,190 in discretionary grants to local units of government to support local impact committees, certain legal services, and technical or project-related support. The Mining Investment and Local Impact Fund Board's funding sources include loans from general purpose revenues, the net proceeds tax on metallic mining, and the iron ore concentrate tax.

The Wisconsin Geological and Natural History Survey published the first reconnaissance bedrock geology map in its new 1:250,000-scale map series by releasing the "Bedrock Geology of Northeast Wisconsin." This mapping program continued throughout the year with work on the west-central, east-central, and northwest sheets. Reconnaissance bedrock geologic mapping was also initiated in the southwestern area during the year. The survey also published a new, comprehensive report and map (scale 1:100,000) of bedrock geology in Marathon County.[7] The report presents a major analysis of this Precambrian terrane that ranges in age from Archean to Middle Proterozoic and includes a wide range of rock types and mineralization. The survey was also preparing Pleistocene maps of 12 counties at a scale of 1:100,000.

During the year, the U.S. Congress passed the Wisconsin Wilderness Act of 1984, which became Public Law 98-321 on June 19, 1984. Four National Forest areas were designated "wilderness" and became components of the National Wilderness Preservation System. The areas included 4,235 acres known as the Porcupine Lake Area of Chequamegon National Forest in Bayfield County and several portions of the Nicolet National Forest in Forest County, known collectively as the Headwaters Wilderness. Headwaters consists of the Kimball Creek Unit (7,527 acres), Headwaters of the Pine Unit (8,872 acres), and the Shelp Lake Unit (3,705 acres). These areas had previously been designated as suitable for wilderness preservation under the U.S. Forest Service Roadless Area Review and Evaluation (RARE II) program.

Wisconsin received $728,750 from the Federal Government during fiscal year 1984 for its share of funds generated by activities (timbering, mineral leasing, recreation, user fees, etc.) on national forest lands. This figure compares with $556,500 the State received in fiscal year 1983.

The U.S. Bureau of Land Management (BLM) continued to work on its plan to dispose of its public domain lands in Wisconsin. BLM administers approximately 4,200 acres of public lands consisting of nearly 830 tracts scattered throughout 59 Wisconsin counties. Federal mineral ownership under State, county, and private surface ownership totals approximately 148,000 acres. Management responsibilities of the lands would be transferred to other Federal, State, or local agencies that

could do a better job of on-site management. During 1984, a Memorandum of Understanding between BLM and Wisconsin was signed to facilitate the land exchange. Meetings were held with Wisconsin DNR officials to refine the list of islands identified to be transferred to the State for recreation and public purposes. A summary of the management situation and draft of preferred alternatives were distributed to Federal, State, and local government agencies and the general public for review and comment. BLM planned to release the Wisconsin Proposed Plan and Environmental Assessment in early 1985.

The U.S. Bureau of Mines had several active contracts and grants with industrial firms, educational institutions, and consulting firms in Wisconsin for services and equipment. Funding for these services was approximately $180,000 in fiscal year 1984.

REVIEW BY NONFUEL MINERAL COMMODITIES

NONMETALS

Abrasive Stone.—Baraboo Quartzite Co. Inc. continued to mine quartzite at its quarry near Baraboo, Sauk County, for use as a deburring and burnishing medium. This is one of two quarries in the United States reporting to the U.S. Bureau of Mines this type of use for its stone. The extremely hard stone is crushed, tumbled, sized, and packaged in 100-pound bags for shipment to metal stamping plants in several States and foreign countries. Shipments increased about 27% over those of 1983.

Cement.—Two companies operated clinker-grinding facilities during 1984. National Gypsum, Huron Cement Div., operated a plant at Superior, and St. Marys Wisconsin Cement Inc., a subsidiary of St. Marys Cement Ltd., operated a plant at Milwaukee. Both companies ship in clinker and other materials for their cement from out-of-State sources. Shipments of portland cement increased dramatically when compared with 1983 figures, but value per short ton decreased about 5%. Part of the large increase in shipments can be attributed to National Gypsum's resumption of production at its Superior plant in early 1984 after being inactive since September 1982. Both companies produced Types I and II, general use and moderate heat portland cement. St. Marys also produced masonry cement. Shipments of masonry cement increased about 22% and value per ton increased 29% compared with 1983 figures.

Major sales of cement were to ready-mixed concrete companies, followed by concrete product manufacturers and highway contractors. Most of the cement produced in the State was shipped in bulk form. All shipments were by truck.

Lime.—Nationally, Wisconsin ranked 13th of 38 States producing lime. In terms of value, lime was the third most important mineral commodity produced in the State, following crushed stone and sand and gravel. Three companies produced lime at five plants. CLM operated a plant at Superior in Douglas County, Rockwell Lime Co. operated a plant at Manitowoc in Manitowoc County, and Western Lime & Cement Co. operated plants in Brown, Dodge, and Fond du Lac Counties. Both quicklime and hydrated lime were produced at each of the plants. Lime production increased about 17% compared with 1983 figures. The average price per short ton dropped about 3%. Quicklime accounted for about 72% of lime sales. Wisconsin ranked first in the production of mason's lime with 21% of the Nation's total and also was a leading producer of lime for the paper and pulp industry with 11% of the U.S. total. About 141,000 short tons of lime (from all domestic sources) was consumed in Wisconsin during 1984, down from the 154,000 tons reported in 1983.

During the year, Western Lime continued construction on a new rotary kiln unit at its Eden plant in Fond du Lac County. In late December, the kiln was fired for the first time for an operational check. The kiln was expected to be placed in full operation in early 1985. Maximum capacity was to be 250 tons of quicklime per day. With the addition of the rotary kiln at the Eden plant, Western Lime planned to shut down the shaft kilns at its Knowles plant and operate only a pressure hydrator, mortar blender, and a bagging plant at the site. Quicklime would be supplied from the Eden plant.[8]

Peat.—Waukesha County, with three producers, accounted for all of Wisconsin's peat output in 1984. Peat for general soil improvement was produced from bogs near New Berlin by Bogda's Top Soil & Excavating Co. and Certified Peat & Sod Inc. Demilco Inc., a division of Nitragin Sales Corp., produced reed-sedge peat near Delafield that it sold in bulk and packaged form for use as an ingredient for seed inoculant.

Sales of peat increased about 6% compared with 1983 figures. Value increased about 31%.

Perlite (Expanded).—Midwest Perlite Co. expanded crude perlite obtained from mines in Western States at its Appleton plant in Outagamie County. Sales increased slightly during the year; value per short ton increased about $2.00. Major use of the product was for horticultural purposes; lesser quantities were used as concrete and plaster aggregates and cavity fill insulation.

Sand and Gravel.—*Construction.*—Construction sand and gravel production is surveyed by the U.S. Bureau of Mines for even-numbered years only; the 1983 chapter gave estimates. Data for odd-numbered years are based on annual company estimates made before yearend.

Nationally, Wisconsin ranked 13th in the production of construction sand and gravel. Sand and gravel used in construction accounted for 30% of Wisconsin's nonfuel mineral value. Production occurred in 60 of the State's 72 counties. There were 160 producers extracting sand and gravel at 304 locations. Production increased 25% during the year; value per short ton increased 6%. Increased sales were the result of a stronger economy and an expansion in housing and other construction.

Table 6.—Wisconsin: Construction sand and gravel sold or used in 1984, by major use category

Use	Quantity (thousand short tons)	Value (thousands)	Value per ton
Concrete aggregate	3,494	$9,050	$2.59
Plaster and gunite sands	50	95	1.90
Concrete products	179	451	2.51
Asphaltic concrete	1,307	2,948	2.25
Road base and coverings[1]	4,580	8,812	1.92
Fill	1,128	1,774	1.57
Snow and ice control	177	351	1.99
Railroad ballast	17	122	7.11
Other	6,853	14,642	2.14
Total or average	17,785	38,245	2.15

[1]Includes road and other stabilization (cement and lime).

Table 7.—Wisconsin: Construction sand and gravel sold or used by producers, by county

County	1982			1984		
	Number of mines	Quantity (thousand short tons)	Value (thousands)	Number of mines	Quantity (thousand short tons)	Value (thousands)
Adams	1	30	$43	2	W	W
Ashland	2	34	55	2	W	W
Barron	9	129	251	10	218	$464
Bayfield	1	1	1	1	W	W
Brown	1	W	W	4	216	652
Buffalo	3	10	16	2	14	22
Burnett	3	78	207	3	42	85
Calumet	1	W	W	1	15	33
Chippewa	1	61	103	10	461	726
Clark	2	126	364	3	201	345
Columbia	--	--	--	3	267	836
Crawford	2	W	W	1	73	262
Dane	13	444	944	14	821	2,030
Dodge	5	107	170	13	W	W
Door	17	220	559	9	146	288
Douglas	2	35	183	2	65	363
Dunn	2	W	W	1	51	76
Eau Claire	2	W	W	3	459	810
Florence	--	--	--	1	10	18
Fond du Lac	2	W	W	5	159	223
Forest	1	45	109	6	65	179
Green Lake	2	55	167	2	252	556
Jackson	2	W	W	5	359	1,155
Jefferson	2	47	102	2	56	115
Juneau	8	17	25	--	--	--
Kenosha	4	569	1,474	4	424	1,056
Kewaunee	7	153	234	3	84	305

See footnotes at end of table.

Table 7.—Wisconsin: Construction sand and gravel sold or used by producers, by county —Continued

County	1982			1984		
	Number of mines	Quantity (thousand short tons)	Value (thousands)	Number of mines	Quantity (thousand short tons)	Value (thousands)
La Crosse	1	34	$34	1	20	$45
Langlade	2	W	W	7	262	W
Lincoln	11	144	229	11	232	431
Manitowoc	8	851	1,392	15	489	879
Marathon	5	277	659	2	53	150
Marinette	1	42	62	5	157	262
Marquette	2	70	140	--	--	--
Oconto	4	216	348	5	219	459
Oneida	8	199	448	8	266	604
Outagamie	--	--	--	1	6	9
Ozaukee	5	189	364	6	147	283
Pepin	2	29	40	1	22	22
Pierce	1	82	178	2	150	150
Polk	5	93	135	6	W	W
Portage	4	898	1,405	4	647	949
Price	4	19	42	4	29	29
Racine	5	564	871	4	163	415
Richland	1	12	12	2	56	237
Rock	5	676	1,423	7	643	1,394
Rusk	5	276	388	3	140	251
St. Croix	4	175	370	3	83	174
Sauk	3	W	W	10	354	1,120
Shawano	3	206	567	2	W	W
Sheboygan	8	336	601	3	W	W
Taylor	14	502	684	14	503	1,157
Vilas	5	77	138	3	137	231
Walworth	5	464	872	12	724	1,563
Washington	6	811	1,487	7	1,203	2,221
Waukesha	21	2,816	6,053	22	4,000	8,194
Waupaca	10	221	609	11	229	575
Waushara	1	W	W	3	133	315
Undistributed[1]	18	2,079	4,660	8	2,258	5,527
Total[2]	272	14,515	29,218	304	17,785	38,245

W Withheld to avoid disclosing company proprietary data; included with "Undistributed."
[1]Includes Iron, Sawyer, Washburn, and Winnebago Counties, sand and gravel that cannot be assigned to specific counties (1982), and data indicated by symbol W.
[2]Data may not add to totals shown because of independent rounding.

Industrial.—Three companies produced sand for industrial purposes in seven counties. Production increased markedly during 1984 as the economy improved. Average value per short ton decreased 4%. Major sales of industrial sand were for foundry applications, glass manufacturing, hydraulic fracturing, and sandblasting.

Stone.—Stone production is surveyed by the U.S. Bureau of Mines for odd-numbered years only; therefore, this chapter contains only estimates for 1984. Data for even-numbered years are based on annual company estimates made before yearend.

Sulfur (Recovered).—Murphy Oil Corp. continued to recover byproduct sulfur at its oil refinery in Superior. About 1,800 metric tons was recovered during 1984, roughly 200 tons less than was recovered in 1983.

Vermiculite (Exfoliated).—Koos Inc. exfoliated crude vermiculite from out-of-State sources at a plant in Kenosha. Major sales of the product were for agricultural purposes. Lesser quantities were used for loose-fill and packing insulation and concrete and roofing aggregates. Sales volume was essentially unchanged from that of 1983.

[1]State Mineral Officer, Bureau of Mines, Minneapolis, MN.
[2]Associate professor, Minerals Information, Wisconsin Geological and Natural History Survey, Madison, WI.
[3]Editorial assistant, Bureau of Mines, Minneapolis, MN.
[4]Wisconsin Department of Transportation, Division of Highways and Transportation Facilities. Construction Section Annual Report—1984. 12 pp.
[5]Harkin, D. A. Mineral Transactions Activity and Terms in Wisconsin—1984. Univ. WI, Agri. Econ. Staff Paper No. 233, 1985, 9 pp.
[6]Seaway Port Authority of Duluth. Port of Duluth-Superior Marine Tonnage. Rep. No. 9, Dec. 1984 final, 6 pp.
[7]La Berge, G. L., and P. E. Myers. Precambrian Geology of Marathon County, Wisconsin. WI Geol. and Nat. History Surv., IC 45, May 1984, 88 pp.
[8]Pit & Quarry. Western Lime & Cement Starts New Chapter in Its Growth Record. V. 88, No. 5, May 1985, pp. 41-43.

Table 8.—Principal producers

Commodity and company	Address	Type of activity	County
Abrasive stone:			
Baraboo Quartzite Co. Inc	Box 123 Baraboo, WI 53913	Quarry and plant	Sauk.
Cement:			
National Gypsum Co., Huron Cement Div.	4000 Town Center Suite 2000 Southfield, MI 48075	Grinding plant	Douglas.
St. Marys Wisconsin Cement Inc., a subsidiary of St. Marys Cement Ltd.	2200 Yonge St. Toronto, Ontario M4S 2C6 Canada	do	Milwaukee.
Iron oxide pigments (finished):			
DCS Color & Supply Co. Inc	2011 South Allis St. Milwaukee, WI 53207	Plant	Do.
Lime:			
CLM Corp	12th Ave. West and Waterfront St. Duluth, MN 55802	do	Douglas.
Rockwell Lime Co	Route 2, Box 124 Manitowoc, WI 54220	do	Manitowoc.
Western Lime & Cement Co	Box 57 West Bend, WI 53095	Plants	Brown, Dodge, Fond du Lac.
Peat:			
Bogda's Top Soil & Excavating Co.	12600 West Cleveland Ave. New Berlin, WI 53151	Bog and plant	Waukesha.
Certified Peat & Sod Inc	19000 West Lincoln Ave. New Berlin, WI 53151	do	Do.
Demilco Inc., a division of Nitragin Sales Corp.	3101 West Custer Ave. Milwaukee, WI 53209	do	Do.
Perlite (expanded):			
Midwest Perlite Co	4280 Parkway Blvd. Appleton, WI 54911	Plant	Outagamie.
Sand and gravel:			
Construction:			
American Materials Corp	Box 388 Eau Claire, WI 54701	Pits and plants	Barron, Chippewa, Dunn, Eau Claire.
Janesville Sand & Gravel Co., Lycon Inc.	Box 427 Janesville, WI 53545	do	Columbia, Dane, Rock.
Johnson Sand & Gravel Inc	N8 W22590 Johnson Dr. Waukesha, WI 53186	do	Waukesha.
Arthur Overgaard Inc	Box 87 Elroy, WI 53929	do	Adams, Columbia, Jackson, Washburn.
Valley Sand & Gravel Corp	S63 W197 Luckow Dr. Muskego, WI 53150	Pit and plant	Waukesha.
Wissota Sand & Gravel Co	Box 1268 Eau Claire, WI 54702	Pits and plants	Barron, Rusk, Washington.
Industrial:			
Badger Mining Corp	Box 97 Fairwater, WI 53931	do	Green Lake, Jackson, Marinette.
A. F. Gelhar Co. Inc	Box 209 Berlin, WI 54923	do	Waupaca and Winnebago.
Treco Sales Inc	Box 38 Bartlesville, OK 74003	Underground mine and plant.	Pierce.
Unimin Corp	258 Elm St. New Canaan, CT 06840	Pit and plant	Columbia.
Stone (1983):			
Crushed:			
Granite:			
Belanger Granite Co	Route 2 Auburndale, WI 54412	Quarry and plant	Marathon.
Carl Wimmer	2807 Dove Ave. Wausau, WI 54401	do	Do.
Wissota Sand & Gravel Co.	Box 1268 Eau Claire, WI 54702	do	Douglas.
Limestone and dolomite:			
Halquist Stone Co. Inc.[1]	N52 W23564 Lisbon Rd., Box B Sussex, WI 53089	Quarries and plant	Waukesha.
Arthur Overgaard Inc	Box 87 Elroy, WI 53929	Quarries and plants.	Buffalo, Juneau, La Crosse, Monroe.
Vulcan Materials Co., Midwest Div.	Box 6 Countryside, IL 60525	do	Milwaukee, Racine, Waukesha, Winnebago.

See footnotes at end of table.

Table 8.—Principal producers —Continued

Commodity and company	Address	Type of activity	County
Stone (1983) —Continued			
Crushed —Continued			
Sandstone and quartzite:			
Foley Bros. Inc	Rock Springs, WI 53961	Quarry and plant	Sauk.
Minnesota Mining & Manufacturing Co.	3M Center St. Paul, MN 55101	do	Marathon.
Traprock (basalt):			
GAF Corp	Box 630 Pembine, WI 54156	do	Marinette.
TCI Traprock Inc.	Box 176 Dresser, WI 54009	do	Polk.
Dimension:			
Granite:			
Anderson Bros. & Johnson Co.	Box 26 Wausau, WI 54401	Quarries and plant	Marathon and Marinette.
Cold Spring Granite Co	Route 2, Box 416 Wausau, WI 54401	Quarry and plant	Marathon.
Lake Wausau Granite Co.	Box 397 Wausau, WI 54401	do	Do.
Limestone:			
Buechel Stone Center Inc	Box 907 Fond du Lac, WI 54935	Quarries and plant	Fond du Lac.
Halquist Stone Co. Inc.[2]	N52 W23564 Lisbon Rd., Box B Sussex, WI 53089	Quarry and plant	Waukesha.
Sulfur (recovered):			
Murphy Oil Corp	Box 2066 Superior, WI 54880	Byproduct sulfur recovery plant.	Douglas.
Vermiculite (exfoliated):			
Koos Inc	4500 13th Ct. Kenosha, WI 53140	Plant	Kenosha.

[1]Also dimension limestone.
[2]Also crushed limestone.

*U.S. GOVERNMENT PRINTING OFFICE: 1986-491-457:20118